

SRB CRITICAL ITEMS LIST

SUBSYSTEM: RECOVERY

ITEM NAME: CDF Assembly

PART NO.: 10314-0001-104

FM CODE: A02

TEM CODE: 40-04-04

REVISION: BASIC

CRITICALITY CATEGORY: 1

REACTION TIME: Immediate

NO. REQUIRED: 1

DATE: March 1, 2002

CRITICAL PHASES: Final Countdown,
Boost, Separation

SUPERCEDES: March 1, 2001

FMEA PAGE NO.: C-49

ANALYST: S. Finnegan

SHEET 1 OF 4

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FAILURE MODE AND CAUSES: Premature operation caused by:

- o High Temperature
- o Shock/ Vibration
- o Increased sensitivity due to contamination

FAILURE EFFECT SUMMARY: Premature operation of the CDF Assembly during final countdown will cause impact of the nose cap and frustum assembly with the ET or Orbiter resulting in loss of vehicle, mission and crew. Premature operation during boost or separation will cause abnormal aerodynamic forces leading to loss of vehicle control. The prematurely deployed nose cap and frustum assembly will impact other vehicle elements causing loss of vehicle, mission and crew.

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RATIONALE FOR RETENTION:

A. DESIGN

- o Design specification USA SRBE 10SPC-0035
 - No autoignition below 275^oF, paragraph 3.3.7.2 (High Temperature)
 - Shock level per paragraph 3.4.1.4 (Shock)
 - Vibration level per paragraph 3.4.1.3 (Vibration)
 - Contamination control per paragraphs 3.1.2 and 3.1.3 (Increased Sensitivity due to Contamination)
- o Predicted temperature will not exceed 159^oF per SRB Thermal Design Data Book SE-019-068-2H, Table 4.9.1.1. (High Temperature)

- o P/N 10314-0002 explosive material (PETN) certified to MIL-H-387C (Contamination)
- o P/N 10315-0002 (Ensign Bickford) explosive material (PETN) TIP certified to MIL-H-387C and (HMX) cord certified to MIL-H-45444B or P/N 10315-0001 (Teledyne McCormick Selph) explosive material (PETN) TIP certified to MIL-H-387C and (HNS) cord certified to WS5003F or P/N 10315-0003 (OEA Aerospace) explosive material (PETN) tip certified to MIL-H-387C and (HNS) cord certified to WS5003F. (Contamination)
- o Sealed cord prevents the entry of contamination following manufacturing. (Contamination)
- o Qualification
 - Proven design qualified for Saturn V per North American Aviation Qualification Test Summary 67MS1149.
 - Delta Qualification for SRB.
 - o Operating High temperature (250^oF for 30 minutes) (High Temperature)
 - o Pyrotechnic shock (Shock)
 - o Vibration (Shock/Vibration)
 - o 8 and 40 foot drop (Shock/Vibration)
 - o Autoignition determination per 10SPC-0035.(High Temperature)
 - Delta qualification per Ensign Bickford Test Reports, 5860A for the (PETN)-Cord CDF assembly and EB Test Report 86-08-03, 87-1435:DEN for the (HMX)-Cord CDF assembly or Teledyne McCormick Selph TestReport QTR 7786-324A for the (HNS)-Cord CDF assembly or OEA Aerospace test report 11914(01) QTR Rev. A for (HNS-Cord) CDF Assembly.

B. TESTING

- o Lot acceptance test per Ensign Bickford Procedure ATP 0030/2 (PETN-Cord) or ATP 0030/5 (HMX-Cord) or TmCS ATP 817296 (HNS-Cord) or OEA Aerospace ATP 11914 (01) (HNS-Cord)
 - Radiographic examination of entire lot. (Contamination)
 - Vibration tests of all destructive LAT samples. (Shock/Vibration)
 - High temperature (250^oF) function test of 5 percent of the lot. (High Temperature)
- o Lot acceptance test per 11914(01) ATP
 - Post environmental X-ray and N-ray (Contamination)
 - 100 pound pull test (Shock/Vibration)
 - Temperature-humidity-altitude test

C. INSPECTION

The following inspections are performed.

VENDOR RELATED INSPECTION

- o Receiving Inspection. All explosive material certifications and test reports are verified one hundred percent. (Contamination)
 - USA SRBE Quality Assurance
USA SRBE Source Inspection Plan (SIP) 1149 for (PETN)-Cord, (HNS)-Cord or (HMX)-Cord
 - Contractor Quality Assurance

Ensign Bickford Inspection Procedure QA 461/2 for the (PETN)-Cord
Ensign Bickford Inspection Procedure QA 461/3 for the (HMX)-Cord
TMcS Assembly and Inspection Procedure 817296 for the (HNS)-Cord
OEA Aerospace Receiving Inspection Plan 11914(01) RIP for the (HNS-Cord) CDF Assembly
- o Assembly Operation: Moisture content determination, core weight and explosive loading are verified one hundred percent by Contractor Quality Assurance and USA SRBE Quality Assurance. For OEA Aerospace CDF assemblies only, the flexibility test is witnessed one hundred percent by Contractor and USA SRBE Quality Assurance. (Contamination)
 - USA SRBE Quality Assurance

USA SRBE SIP 1149 for the (PETN)-Cord, (HNS)-Cord or the (HMX)-Cord
 - Contractor Quality Assurance

Ensign Bickford Inspection Procedure QA 461/2 (PETN-Cord) or QA 0461/3 (HMX-Cord).
Teledyne McCormick Selph Assembly and Inspection Procedure 817296 (HNS-Cord)
OEA Aerospace Procedures 11914(01) MP (Booster Cup) or 11914(021) MP (HNS-Cord)
- o Lot Acceptance Test. N-ray and X-ray films are examined by certified vendor personnel and verified by USA SRBE personnel. Vibration test is monitored and high temperature function test is witnessed one hundred percent. For OEA Aerospace CDF assemblies only, Helium leak test is witnessed one hundred percent by contractor and USA SRBE Quality Assurance. (All Failure Causes)
 - USA SRBE Quality Assurance

USA SRBE SIP 1149 for the (PETN)-Cord, (HNS)-Cord or (HMX)-Cord
 - Contractor Quality Assurance

Ensign Bickford Acceptance Test Procedure ATP 0030/2 (PETN-Cord) or ATP 0030/5 (HMX-Cord).
Teledyne McCormick Selph (TMcS) ATP 817296 (HNS-Cord)
OEA Aerospace ATP 11914(01) ATP (HNS-Cord)
- o Lot review and certification per USA SRBE Plan 10PLN-0035.
- o Critical Processes/Inspections: The following critical processes and inspections are used to assure that explosive charge is properly sealed and free from cracks, voids, moisture, separation, or contamination. (Contamination)

- X-ray per EB ATP 0030/2 (PETN-Cord) or ATP 0030/5 (HMX-Cord) or TMcS ATP 817296 (HNS-Cord) or OEA Aerospace ATP 11914 (01) (HNS-Cord)
- N-ray per EB ATP 0030/2 (PETN-Cord) or ATP 0030/5 (HMX-Cord) or TMcS ATP 817296 (HNS-Cord) or OEA Aerospace ATP 11914 (01) (HNS-Cord)
- Adhesive bonding per EB Inspection Procedure QA 461/2 (PETN-Cord) or QA 461/3 (HMX-Cord) or TMcS Assembly and Inspection Procedure 817296 (HNS-Cord) or OEA Aerospace Manufacturing Procedures 11914 (01) MP.

KSC RELATED INSPECTION

o Receiving Inspections

- Damage: Visual inspection of pyrotechnic device for evidence of damage, degradation, corrosion, misalignment or moisture is performed per OMRSD File V, Vol.1, requirement number B000FL.005. (Contamination)
- Verify that CDF Assembly has been flight certified by MSFC as required by NSTS 08060 per OMRSD File V, Volume 1, requirement no. B000FL.002. (All Failure Causes)
- Ordnance Installation: Proper installation of the CDF assembly to the detonator subassembly/linear shaped charge on the frustum and CDF bulkhead connector is verified per 10REQ-0021, paragraph 1.1.4.1. (All Failure Causes) CN 044

D. FAILURE HISTORY

- o Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

- o Not applicable to this failure mode.